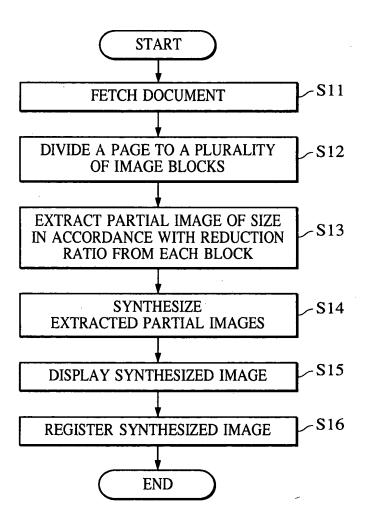


FIG. 3



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#### INFORMATION RECORDING/REPRODUCING METHOD

#### BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention related to an information recording-/reproducing method of effecting the recording and/or reproduction of information on a disk-like recording medium, and particularly to an information recording-/reproducing method in which the recording area of a recording medium is divided into a plurality of zones in the radial direction of the recording medium and the recording/reproduction of information is effected with the rotational speed of the disk made to be different in each zone, whereby the spatial record length of a re-cording pit is made constant over the entire recording

2. Related Background Art

Information recording/reproducing methods of 20 recording/reproducing information on a disk-like re cording medium (hereinaster referred to as the disk) include a magnetic recording/reproducing method directed to a floppy disk and an optical information recording/reproducing method directed to a CD or a magne-

The diameter of disks used in these methods is prescribed as 5.25 or 3 inches, and the recent technical task is how densely information can be recorded on disks of such a diameter.

Various information recording/reproducing methods have heretofore been devised to solve such a task and above all, attention has been paid to a method called MCAV (modified constant angular velocity) or ZCAV (zone constant angular velocity). According to this method, the recording area on the disk is divided into a plurality of zones in the radial direction of the disk, and the recording/reproducing frequency of each zone is made higher from the inner peripheral zone toward the outer peripheral zone, thereby making the recording density on the inner and outer peripheries of the recording area constant. According to this method, as compared with the conventional method of effecting recording/reproduction with the number of revolutions and the recording/reproducing frequency kept constant, there is obtained an about 50% increase in recording capacity.

Another method to which attention has been paid is a method called MCLV (modified constant linear velocity) or ZCLV (zone constant linear velocity) in which the recording area on the disk is divided into a plurality of zones in the radial direction of the disk and the number of revolutions of the disk in the respective zones is made lower from the inner peripheral zone toward the outer peripheral zone, thereby making the recording density on the inner and outer peripheries of the recording area constant. Again by this method, as compared with the conventional CAV method, there is obtained an about 50% increase in capacity.

In the former method, however, the linear velocity of the disk is increased toward the outer periphery of the disk and this leads to a problem that the transfer speed of reproduced data is varied by the reproducing position of the disk, and the usability of the device as an information recording/reproducing apparatus is poor. Also, a reproducing signal processing system must accomodate the transfer speed of the outermost peripheral

lata, and if such a signal processing system dose this, it an waste the inner peripheral portion of the disk.

Also, in the latter method, the transfer speed of repro-uced data is constant in the inner and outer peripheries of the disk, but when the seeking of a recording/reproducing head is performed beyond a zone, a long time is aken until the number of revolutions of a spindle motor for rotating the disk becomes equal to the number of revolutions of the corresponding zone, and this has led to a problem that the seeking time becomes long.

#### SUMMARY OF THE INVENTION

The present invention has been made in view of the bove-noted problems and has as its object the provition of an information recording/reproducing method n which the recording density is made constant on the nner and outer peripheral portions of a disk to thereby increase the recording density, the transter speed of reproduced data is constant in the inner and outer peripheral portions of the disk, and a long seeking time is ot required.

not required.

To achieve the above object, an information recording/reproducing method according to the present invention is provided in which a recording area is divided into a plurality of zones in the radial direction of a disk so that the lengths of recording pits may become the same in the entire recording area of the disk and the ecording/reproduction of information is effected with the number of revolutions of the disk changed in each one from the inner peripheral zone toward the outer peripheral zone. The method comprises the step of effecting the recording of reproduction of the informaion without changing the number of revolutions if the mount of information to be recorded or reproduced is equal to or smaller than a predetermined amount when eking is effected from a zone in which a recording/reproducing head is on standby to a different zone to effect the recording or reproduction.

Also, an information recording/reproducing method provided in which a recording area is divided into a lurality of zones in the radial direction of a disk so that the lengths of recording pits may become the same in the entire recording area of the disk and the recordingreproduction of information is effected with the numer of revolutions of the disk changed in each zone from he inner peripheral zone toward the outer peripheral zone. The method comprises the step of effecting, when zone in which the frequency of recording or reproduction exceeds a predetermined value is created in a series of recording or reproducing operations, the next ecording or reproduction at a number of revolutions

orresponding to that zone.

Also, an information recording/reproducing method is provided in which a recording area is divided into a plurality of zones in the radial direction of a disk so that the lengths of recording pits may become the same in he entire recording area of the disk and the recording/ reproduction of information is effected with the num-ber of revolutions of the disk changed in each zone from the inner peripheral zone toward the outer peripheral zone. The method comprises the step of effecting, when zone in which recording or reproduction is effected and continues a predetermined or greater number of mes, the next recording or reproduction at a number

revolutions corresponding to that zone.

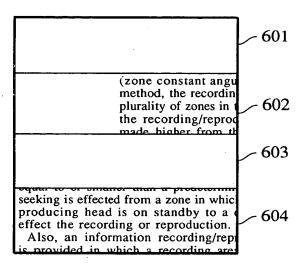
Also, an information recording/reproducing method provided in which a recording area is divided into a plurality of zones in the radial direction of a disk so that

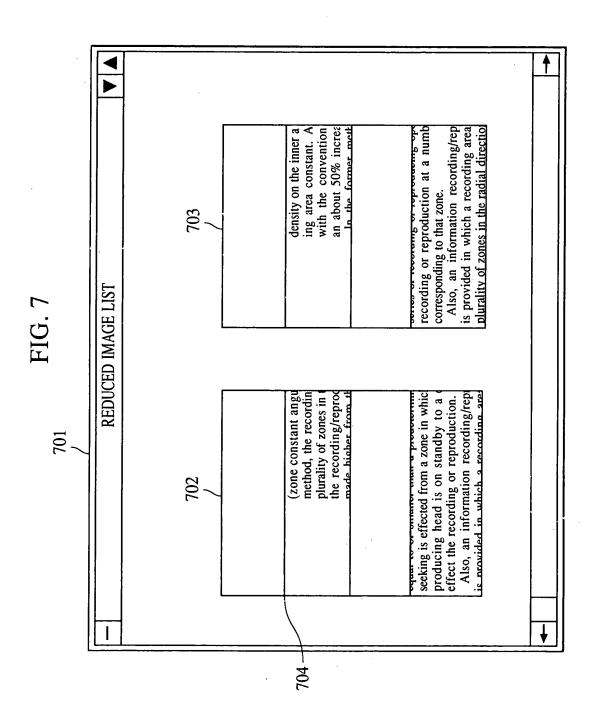
22 IMAGE BLOCK B

24 IMAGE BLOCK D

FIG. 5					
INFORMATION	5,394, 1 RECORDING/REPRODUCING	data, and if such a signal processing sy			
	METHOD	Also, in the latter method, the transfeduced data is constant in the inner and	speed of repro- outer peripheries		
1. Field of the Invention rel /reproducting method reproduction of informedium, and particu /reproduction of informedium, and particu /reproducting method recording medium is the radial direction recording /reproduction the rotational speed each zone, whereby cording pit is made area.  2. Related Backgro Information recording/reproducing medium (he include a magnetic to rected to a floppy dis ding/reproducing me to-optical disk.  The diameter of discribed as 5.25 or 3 is is how densely information such a diameter.  Various information such a diameter.  Various information have heretofore been above all, attention MCAV (modified control of the	ntion  ted to an information recording- of effecting the recording and/or rmation on a disk-like recording larly to an information recording- in which the recording area of a divided into a plurality of zones in of the recording medium and the on of information is effected with of the disk made to be different in the spatial record length of a re- constant over the entire recording  und Art rding/reproducing methods of ng information on a disk-like re- recinafter referred to as the disk) ecording/reproducing method di- k and an optical information recor- hod directed to a CD or a magne- sks used in these methods is pre- neches, and the recent technical task nation can be recorded on disks of on recording/reproducing methods devised to solve such a task and has been paid to a method called nation and the disk is divided into a the radial direction of the disk, and ucing frequency of each zone is inner peripheral zone toward the e, thereby making the recording which attention has been paid is a / (modified constant linear veloc- constant linear velocity) in which the disk is divided into a plurality direction of the disk and the num- the disk is divided into a plurality direction of the disk and the num- the disk is divided into a plurality direction of the disk and the num- the disk is divided into a plurality direction of the disk and the num- the disk is divided into a plurality direction of the disk and the num- the disk in the respective zones is inner peripheral zone toward the e, thereby making the recording	of the disk, but when the seeking of a ducing head is performed beyond a zor taken until the number of revolutions of for rotating the disk becomes equal trevolutions of the corresponding zone, to a problem that the seeking time becomes are the seeking time becomes are the seeking time becomes are the seeking time becomes and has as its sign of an information recording/repr in which the recording density, is made inner and outer peripheral portions of increase the recording density, the treproduced data is constant in the innipheral portions of the disk, and a long not required.  To achieve the above object, an infing/reproducing method according invention is provided in which a recovided into a plurality of zones in the radiad six so that the lengths of recording area of recording/reproduction of information he number of revolutions of the disk zone from the inner peripheral zone to peripheral zone. The method comprefecting the recording of reproduction on without changing the number of reamount of information to be recorded and the recording area of recording and so or star above a suffice the country that it is a good from the lengths of recording pits may been heard in this area of the disk and reproduction of information is effected by the second of the disk changed in the inner peripheral zone toward the recording area of the disk changed in which the frequency of recording the recording or reproduction of ecording or reproduction of ecording or reproduction of provided in which the frequency of recording or reproduction at a number corresponding to that zone. Also, an information recording/reprise provided in which a recording freprise provided in which a reco	ecording/repro-  , a long time is a spindle motor the number of and this has led mes long.  NTION  in view of the bjest the previous ducing method constant on the disk to thereby anster speed of er and outer pe- seeking time is  prmation recor- to the present ding area is di- dial direction of its may become the disk and the its effected with thanged in each oward the outer ses the step of of the informa- volutions if the er reproduced is a amount when a recogding/re- fferent zone to ducing method divided into a of a disk so that me the same in the recording- time the content actions, when rding or repro- is created in a ations, the next of revolutions ducing method s divided into a of a disk so that me the came in section of the content ducing method stivided into a of a disk so that me the came in		
ing area constant. A with the convention an about 50% increas In the former meth the disk is increased disk and this leads to of reproduced data is tion of the disk, and information recordia Also, a reproducing	gain by this method, as compared all CAV method, there is obtained in capacity.  od, however, the linear velocity of toward the outer periphery of the a problem that the transfer speed is varied by the reproducing posithe usability of the device as an agreeproducing apparatus is poor. Signal processing system must ac-	the entire recording area of the disk an reproduction of information is effecte ber of revolutions of the disk changed in the inner peripheral zone toward the zone. The method comprises the step of a zone in which recording or reproduct and continues a predetermined or greatment, the next recording or reproduct of revolutions corresponding to that zor Also, an information recording/reprise provided in which a recording area in plurality of zones in the radial direction	i with the num- each zone from buter peripheral effecting, when tion is effected ater number of on at a number e. ducing method s divided into a		
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FIG. 6

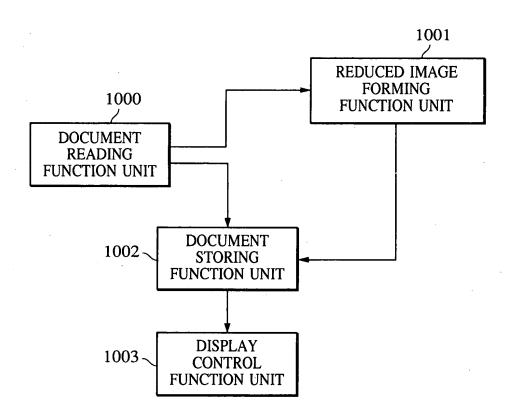




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	ID OP MA (O)	ECORDING/REPRODUCING		tem dose this, it If the disk.
		METHOD	so the late me look he ans	
	BACKGROU	ND OF THE INVENTION 5	duced data is constant in the inner and	outer peripheries
	1. Field of the Inve	_	ducing head is performed beyond a zon	
	This invention not		taken until the number of revolutions of	
	/reproducing method	of effecting the recording and/or rmation on a disk-like recording and and a selvent as a selve	for rotating the disk becomes equal to revolutions of the corresponding zone,	
	mountain, and partieu	raily to all illioinlation recolding-	to a problem that the seeking time become	
		in which the recording area of a divided into a plurality of zones in	SUMMARY OF THE INVE	TION
	the radial direction	of the recording medium and the	The present invention has been mad	
	recording/reproducti	on of information is effected with of the disk made to be different in	sion of an information recording/repr	ducing method
	each zone, whereby	ine spatial record length of a re-	in which the recording density is made inner and outer peripheral portions of a	
	cording pit is made area.	constant over the entire recording	increase the recording density, the tr	anster speed of
	<ol><li>Related Backgro</li></ol>		reproduced data is constant in the innripheral portions of the disk, and a long	
		rding/reproducing methods of congression of congression on a disk-like re-	not required.	
	cording medium (he	reinafter referred to as the disk)	To achieve the above object, an inf ding/reproducing method according	
		ecording/reproducing method di- k and an optical information recor-	invention is provided in which a recor	ding area is di-
		hod directed to a CD or a magne-	wided into a plurality of zones in the ra a disk so that the lengths of recording p	
	to-optical disk. The diameter of d	sks used in these methods is pre-	the same in the entire recording area of	the disk and the
	scribed as 5.25 or 3 i	nches, and the recent technical task	recording/reproduction of information the number of revolutions of the disk	
	such a diameter.	nation can be recorded on disks of 30	zone from the inner peripheral zone to	ward the outer
802	Various information	n recording/reproducing methods	peripheral zone. The method compressed the recording of reproduction	of the informa-
002	above all, attention	devised to solve such a task and has been paid to a method called	tion without changing the number of re	volutions if the 804
-	MCAV (modified co	nstant angular velocity) or ZCAV llar velocity). According to this g area on the disk is divided into a	amount of information to be recorded of	
	r ether, the need div	area on the disk is divided into a		d amount when a recording/re-
	pip ality of 7 des 1	he radial direction of the disk, and	rice the economy of regrod ctio	
	in the nor in	ucing frequency of each zone is inner peripheral zone toward the	Aso an information regording from	ducing method
		e, thereby making the recording nd outer peripheries of the record-	plurality of zones in the radial direction	of a disk so that
	ing area constant. A	cording to this method, as com-	the lengths of recording pits may become the entire recording area of the disk an	
		ntional method of effecting recor- th the number of revolutions and	reproduction of information is effected	with the num-
	the recording/repro	ducing frequency kept constant,	ber of revolutions of the disk changed in the inner peripheral zone toward the	
	there is obtained an capacity.	about 50% increase in recording	zone. The method comprises the step of	effecting, when
	Another method to	which attention has been paid is a	a zone in which the frequency of reco duction exceeds a predetermined value	
		/ (modified constant linear veloc- constant linear velocity) in which	series of recording or reproducing oper	ations, the next
	the recording area on	the disk is divided into a plurality	recording or reproduction at a numbe corresponding to that zone.	or revolutions
		direction of the disk and the num- the disk in the respective zones is	Also, an information recording/repre	
	made lower from the	inner peripheral zone toward the 55	is provided in which a recording area in plurality of zones in the radial direction	of a disk so that
<del>- • • • • • • • • • • • • • • • • • • •</del>		e, thereby making the recording nd outer peripheries of the record-	the lengths of recording pits may been the entire recording area of the disk an	me the same in
	ing area constant. A	nd outer peripheries of the record- gain by this method, as compared I CAV method, there is obtained	reproduction of information is effecte	with the num-
	an about 50% increas	e in capacity.	ber of revolutions of the disk changed in the inner peripheral zone toward the	
		od, however, the linear velocity of toward the outer periphery of the	zone. The method comprises the step of	effecting, when
	disk and this leads to	a problem that the transfer speed varied by the reproducing posi-	a zone in which recording or reproduce and continues a predetermined or gre	
	of reproduced data i	varied by the reproducing posi- the usability of the device as an 65	times, the next recording or reproduct	on at a number
	information recording	g/reproducing apparatus is poor.	of revolutions corresponding to that zon Also, an information recording/repre	
	Also, a reproducing	ignal processing system must ac- speed of the outermost peripheral	is provided in which a recording area	s divided into a
	· · · · · · · · · · · · · · · · · · ·	space of the outermost peripheral	plurality of zones in the radial direction	of a disk so that
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INFORMATION	901
(zone constant ang method, the recording plurality of zones in the recording/repromade higher from the	902
387  data, and if such a signal processing sycan waste the inner peripheral portion	<b>y</b> 903
Also, in the latter method, the transf	904

FIG. 10



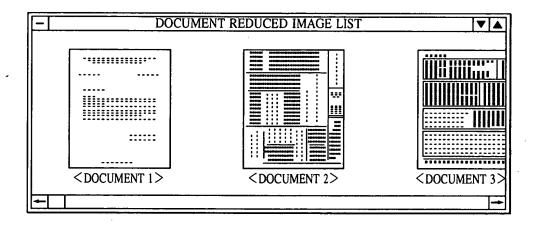
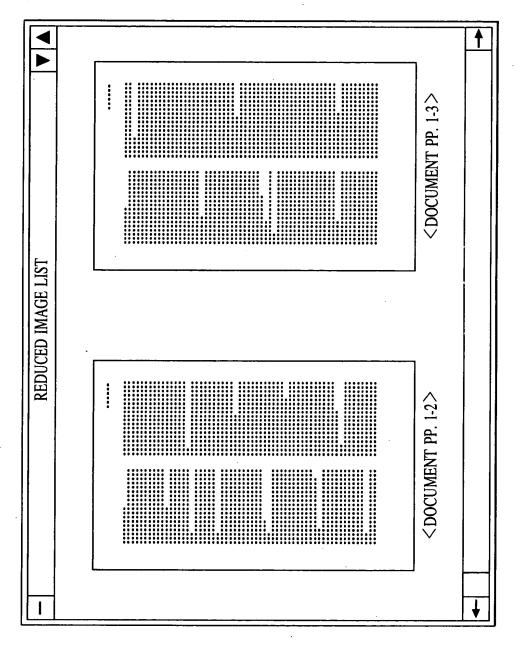


FIG. 12



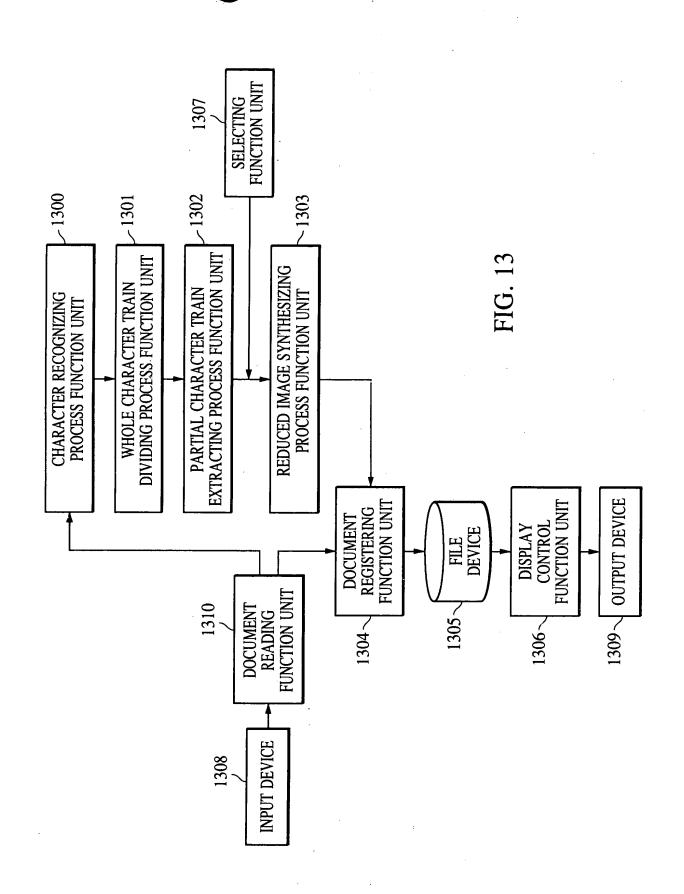
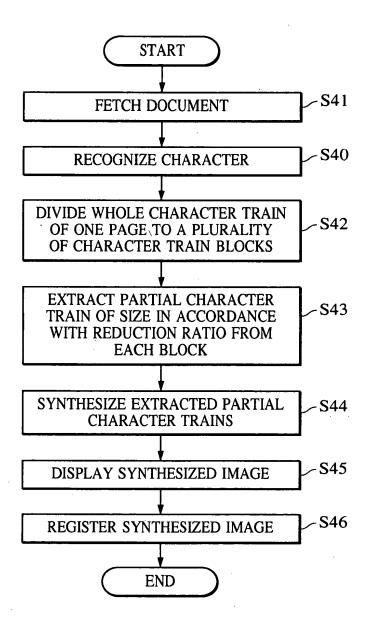


FIG. 14



420

121e CHARACTER TRAIN BLOCK A

122e CHARACTER TRAIN BLOCK B

124e CHARACTER TRAIN BLOCK D

ention related to an information recording reproducing method of effecting the recording and/or reproduction of nformationon a disk-like recording medium, and particularly to an informationrecording/reproducing method in which the recording area of arecording medium is divided into a plurality of zones in the radialdirection of the recording medium and the recording/reproduction ofinformation is effected with the rotational speed of the disk made tob different in each zone, whereby the spatial record length of a recording pit is made constant over the entire recording area. 2 Related Background Art Information recording/reproducing methods of recording/reproducing information on disk-like recording medium (hereinafter referred to as the disk) include a magnetic recording/reproducing metho directed to a floppy disk and an optical information recording/reproducing method directed to a CD or a magneto-optica disk. The diameter of disks used in these methods is prescribed as 5.25or 3 inches, and the recent technical task is how denselyinformation can be recorded on disks of such a diameter. Various information recording/reproducing methods nave heretofore been devised to solve such a task and above all, attention has beenpaid to a method called MCAV modified constant angular velocity) or ZCAV (zone constant angular velocity). According to this method, the recording the disk is divided into a primality of zones in the tapital direction of the risk, and the tecording the producing equency of each lone is made higher from the imporperipheral zone toward the outer peripheral zone, thereby making e recording density on the inner and outer peripheries of the recording area constant.. According to this method, a compared with the conventional method of effecting recording reproduction with the number of revolutions and the recording/reproducing frequency kept constant, there is obtained an about 50% increase in recording capacity. Anothe method to which attention has been paid is a method called MCLV (modified constant linear velocity) or ZCLV (zone constant linear velocity) in which the recording area on the disk is divided into a plurality of zones in the radial directio of the disk and the number of revolutions of the disk in the respective zones is made lower from the inner periphers zone toward the outer peripheral zone, thereby making the recording density on the inner and outer peripheries of the recording area constant. Again by this method, as compared with the conventional CAV method, there is obtained a about 50% increase in capacity. In the former method, however, the linear velocity of the disk is increased toward the outer periphery of the disk and this leads to a problem that the transfer speed of reproduced data is varied by the eproducing position of the disk, and the usability of the device as an information recording/reproducing apparatus is by/ Alsy a reproducing algual provessing system grusy accomodule the transfer speed of the odicymost periphera data and it such a signal processing system does this, it can waste the inner peripheral portion of the disk. Also, in the atter method, the transfer speed of reproduced data is constant in the inner and outer peripheries of the disk, but when the seeking of a recording/reproducing head is performed beyond a zone, a long time is taken until the numbe o revolutions of a spindle motor for rotating the disk becomes equal to the number of revolutions of the corresponding zone, and this has led to a problem that the seeking time becomes long. SUMMARY OF THE INVENTION The preser invention has been made in view of the above-noted problems and has as its object the provision of an information recording/reproducing method in which the recording density is made constant on the inner and outer periphera portions of a disk to thereby increase the recording density, the transfer speed of reproduced data is constant in the inne and outer peripheral portions of the disk, and a long seeking time is not required. To achieve the above object, an information recording/reproducing method according to the present invention is provided in which a recording area is divided into a plurality of zones in the radial direction of a disk so that the lengths of recording pits may become the ame in the entire recording area of the disk and the recording/reproduction of information is effected with the numbe st revolutions of the disk charless in each zone from the inner seriphetal zone toward the outer seriphetal zone. The nethod comprises the step of offecting the recording or reproduction of the information without changing the number of revolutions if the amount of information to be recorded or reproduced is equal to or smaller than a predetermined amount when seeking is effected from a zone in which a recording/reproducing head is on standby to a different zone to effect the recording or reproduction. Also, an information recording/reproducing method is provided in which a recording area is divided into a plurality of zones in the radial direction of a disk so that the lengths of recording pits may become the same in the entire recording area of the disk and the recording/reproduction of information is effected with the number of revolutions of the disk changed in each zone from the inner peripheral zone toward the outer peripheral zone. The method comprises the step of effecting, when a zone in which the frequency of recording or reproduction exceeds a predetermined value is created in a series of recording or reproducing operations, the next ecording or reproduction at a number of revolutions corresponding to that zone. Also, an information recording/reproducing method is provided in which a recording area is divided into a plurality of zones in the radia direction of a disk so that

> 123e CHARACTER TRAIN BLOCK C

FIG. 16

